secretary brought him into direct contact with most of the leading explorers of the day, and his untiring energy and literary ability were of the greatest service to the Society in collating and recording the result of world-wide investigations. He received the gold medal of the Society in 1888, when he became its president, a position which he held for eight years. Meanwhile, in 1868, he joined the expedition which reached Magdala (Abyssinia) under Lord Napier; and it is evidence of his unusual capacity both for personal observation and the collection of material which would in these days be classed under the head of "intelligence," that he wrote the best popular account of that remarkable expedition which has yet appeared. For ten years after this Sir Clements was in charge of the Geographical Department of the India Office, and this appointment gave him the opportunity for rescuing from oblivion the neglected records of the Indian Navy, and of writing a history of the Indian Survey. The latter is the only popular work on this subject which exists, and it much wants a writer of the ability of Sir Clements to bring it up to date.

As president of the Royal Geographical Society Sir Clements Markham has left an abiding name. It is not too much to say that he gave his whole soul to the work of maintaining the usefulness of the Society in every branch of geographical activity. He succeeded in impressing the administrative authorities of Government, as well as those of the leading universities, with the necessity for widespread geographical education. Geographical schools and teachers began to be busy, and much of the present interest which is maintained in maps (to be found in every newspaper now) is due to his initiative. If Sir Clements appeared to be somewhat autocratic in council it is at least due to him to say that it was his personal determination which carried through many a project which would have failed in weaker hands. Notably he must be credited with the success of the first Antarctic expedition under his own nominee, Captain Scott. That expedition gave an impetus to Antarctic discovery which has not ceased yet. As president at the meetings of the Society he was a clear and vigorous speaker, and he always succeeded in importing something of his own vitality into every subject which he handled. A firm, strong friend was Sir Clements, and a somewhat pugnacious enemy; a man of strong views, and possessed of that rare courage—the courage of his opinions. As president of the Hakluyt Society he rescued many an old record from oblivion, and has given to the world a series of most interesting books of ancient adventure and travel—works which will survive through the ages. T. H. HOLDICH.

NOTES.

THE issue of *Science* for December 24 last prints an address by Dr. L. H. Baekeland delivered before a recent joint meeting of the New York Section of the American Chemical Society, the American Electrochemical Society, and the Society of Chemical Industry, on the recent proposals of the Naval Consulting Board of the United States. Dr. Baekeland is a member of the board, and this address is the first public report of the discussions of the board on the so-called "five-million laboratory" proposed by the Naval Consulting Board. The contemplated outlay for the navy for the next five years, for new ships, aviation, and reserve of munitions, amounts to 100,000,000*l*., and the argument of the address is that an expenditure of this magnitude ought to be made as efficient as possible. All doubtful and inferior devices must be eliminated by direct experiment, by research and tests, before it is too late to remedy them. The advisory board has stated the facts as it saw them, and confronted the secretary of the navy with the probable maximum expenses for research and experimentation, commensurate to the five years' naval building programme now under contemplation. The five-million dollar budget, or 1,000,000*l*., for experimental work to be expended during those five years, or about 200,000*l*. a year, may, says Dr. Baekeland, strike the uninitiated as needlessly large, although it is only about what some industrial enterprises have found necessary to spend on their own experimental work. The corrosion of condenser tubes of American warships involves an annual damage of about 400,000*l*. If 200,000*l*. were spent on research on this problem alone, with the result of reducing the damage to one-half, the total outlay would be compensated in a few months' time, aside from the important fact that the fleet would be stronger because less of the ships would be unavailable for service.

DR. C. GORDON HEWITT, dominion entomologist of Canada, has been elected president of the American Association of Economic Entomologists for 1916.

AT the annual meeting of the Challenger Society on January 26 the following officers were elected for the ensuing year:—*Secretary*, Mr. C. Tate Regan; *Treasurer*, Mr. E. T. Browne; *Committee*, Dr. S. F. Harmer, Mr. D. G. Lillie, and Prof. E. W. McBride.

THE gold medal of the Royal Astronomical Society has been awarded to Dr. J. L. E. Dreyer, for his contributions to astronomical history and his catalogues of nebulæ; and it will be presented at the annual meeting of the society to be held on Friday, February 11.

THE annual meetings of the Institution of Naval Architects will be held on Wednesday, April 12, and the following day, in the hall of the Royal Society of Arts, John Street, Adelphi, W.C. Owing to the continuance of the war, the council has decided that it would be unsuitable for the customary entertainments to be given; the annual dinner and evening reception will accordingly not take place.

THE death is announced of Mr. F. M. Webster, a leading American entomologist, at the age of sixty-six. He was professor of entomology at Purdue University from 1885 to 1888, and had held various scientific official positions in connection with the States of Illinois, Indiana, and Ohio, as well as the Federal Department of Agriculture. At the time of his death he was in charge of the cereal and forage-crop insect investigations of this department. One of his most important inquiries was that on which he was engaged from 1886 to 1890 in the solution of the problem of the buffalo gnat in the valley of the Lower Mississippi.

DR. E. W. HILGARD, who has died in California at the age of eighty-three, was a native of Rhenish Bavaria, but was taken to the United States by his parents in early childhood. His scientific studies were pursued at Heidelberg, Zurich, and Freiberg. He became successively State geologist of Mississippi, professor of chemistry at the University of Mississippi, and professor of geology at the University of Michigan. His chief work was done as professor of agriculture at the University of California from 1874 to 1904, and as director of the California Agricultural Experiment Station from 1888 to 1904. In 1875 he established the first experiment station in the United States. He also inaugurated the system of "farmers' institutes." He received the Liebig medal from the Munich Academy of Sciences, and a gold medal from the Paris Exposition of 1900. Dr. Hilgard was the author of numerous reports and monographs, dealing especially with the investigation of soils.

BY the death of Sir Francis H. Lovell on January 28 tropical medicine has lost one of its most ardent advocates. For a period of many years, as dean of the London School of Tropical Medicine, Sir Francis directed and encouraged a work of incalculable benefit to mankind. By missions to the East and to the West he was able to bring home to the dwellers in the tropics the value of a study of tropical diseases, and collected funds to a substantial amount for the endowment of the school. Francis Lovell began his life-work as Colonial Surgeon of Sierra Leone, 1873–78. He then became chief medical officer of Mauritius, and member of the Legislative Council, 1878–93, and was afterwards appointed Surgeon-General of Trinidad and Tobago, and member of the Executive and Legislative Councils, 1893–1901. He retired from the Colonial service in the latter year, and in 1903 became dean of the Tropical School, to the council of which he brought a ripe experience and a full appreciation of the value of scientific research. He was a fellow of the Royal College of Surgeons, was created C.M.G. in 1893, and received the honour of knighthood in 1900. A man of sterling worth and genial personality, his death leaves a blank which will not be filled easily.

THERE is now at the London Library a small but very interesting exhibit of early printed books on astronomy, from the collection of Mr. Gilbert R. Redgrave. Many of them are from the press of Erhard Ratdolt, whose fine work at Augsberg and Venice is so well known. There is a splendid copy of a "Kalendar" by Monteregio (otherwise Regiomontanus), in Italian, and an even finer one in Latin, both printed by Ratdolt at Venice in 1476—works now of great rarity. There is also a very rare folio tract by the same author, "Universis Bonarum Artium Studi," printed at Nuremberg in 1476. These appear to be in absolutely perfect condition. Among other fifteenth-century books mention may be made of a fine copy of Hyginus, "Poeticon Astronomicon," of 1487, as well as the less rare edition of 1488. The diagrams of eclipses, etc., are frequently coloured—some by hand and some printed in colours. Two works of later date, but of special interest, are Galileo's "Istoria e dimostrazioni," of 1613, describing the newly discovered spots on the sun, and announcing the configurations of Jupiter's satellites, and his "Dialogo" on the Ptolemaic and Copernican systems, which occasioned his condemnation by the Inquisition. The only English book is a fine copy of the first edition of Newton's "Principia" (1687).

ON the occasion of the establishment of the Willard Gibbs chair of research in pure chemistry in the University of Pittsburgh, Prof. M. T. Bogert delivered an address on the "Value of Research in Pure Chemistry," which is printed in *Science* (vol. xlii., No. 1091, p. 737). The part played by chemistry, "the intelligence department of industry," in bringing about the astonishing achievements of the last fifty years is sketched briefly but convincingly. Investigations in pure science laid those broad foundations upon which has been erected the wonderful structure of modern industrial operations. It will be recalled that two years ago, when in England, Prof. Bogert put forward the opinion that the most pressing need of the day was the proper endowment of chemical research by the providing of great research institutes and the creation of research professorships. Whilst it seems that in England these words had little effect, the United States are "beginning to awaken to the fact that civilisation unarmed by science is at a terrible disadvantage in the event of a struggle for existence, and that *this arming cannot be done at short notice*. The result is a loud and urgent call upon the universities, colleges, and technical schools of the land for help." The establishment of a chair of research in pure chemistry in so eminently a practical centre as Pittsburgh is an occasion for warmest congratulations. It is peculiarly appropriate that the new chair should bear the name of Josiah Willard Gibbs, who has been styled by Ostwald "by far the greatest man of science America has yet produced."

MANY representatives of chambers of commerce, with mayors, lord provosts, bankers, merchants, and business men attended a meeting held at the Guildhall, London, on Monday, to consider measures which should be taken after the war for the promotion of trade and commerce, and to deal with the subject of industrial employment. The Lord Mayor presided, supported by the Sheriffs and many members of the Corporation. The following motion, proposed by Sir Algernon Firth, president of the Association of Chambers of Commerce, was carried unanimously:—"That in the opinion of this meeting it is desirable that immediate steps be taken by his Majesty's Government, chambers of commerce, and other kindred associations, throughout the country, to formulate in close co-operation adequate action for the defence and improvement of trade and employment after the war, and with this object in view this meeting suggests full discussion of the fiscal, legislative, and voluntary efforts which ought to be made, and of the concentrated action and decisions which must be taken; and recommends the establishment of a Ministry of Commerce to carry out a constructive commercial policy for this country." In moving this resolution, Sir Algernon Firth said that the President and officials of the Board of Trade have every desire to promote trade, and within their powers are efficient; but they have many functions and are choked with administrative work. Frequently since 1869 chambers of commerce have urged the appointment of a Ministry of Commerce. Twice a resolution in its favour has passed the House of Commons, and in 1905 a Bill was promised in the King's Speech. It is essential to have a new Minister who will gather round him men of experience and judgment, and confine himself to steps to be taken after the war for the development of trade.

THE interest of the recently issued report of the Development Commissioners for the year ended March 31, 1915, lies not so much in its record of successful effort in the promotion of agricultural education and research, which have figured so prominently in former reports, as in its outline of the efforts of the commissioners to apply their energies and resources towards the practical necessities of the abnormal national situation which confronted them during the greater portion of the period under review. In the earlier days of the war, when widespread unemployment was generally anticipated, the attention of the commission was directed to the inception of preventive measures, but with the happy falsification of these fears it soon became necessary rather to discourage the inauguration of works requiring labour suitable for enlistment. At the same time, the commissioners have not lost sight of the possibility of a serious need for labour-employing works after the war, and have devoted their attention to the solution of the initial difficulties of certain projects of development, of which the construction of light railways, land drainage and reclamation, and afforestation are specified, with the view of ensuring that such schemes may be brought into operation quickly in case of emergency. The increase of the production and preservation of home-grown food supplies has been regarded as the chief question for immediate consideration, and substantial aid has been given to schemes designed to secure this end. The report contains much of interest with regard to the progress of schemes outlined in previous reports, but the amount of new work authorised and entered upon during the year was naturally but small. This is particularly the case in connection with the valuable scientific research work supported by the commission. It is gratifying to note, however, that no effort has been spared to ensure the continuity of the work of the newly-founded research institutes, although the inevitable depletion of staffs has necessarily greatly curtailed their activities.

THE *Psychological Bulletin* (vol. xii., No. 12) summarises in a useful form the recent published work on social and religious psychology. Perhaps the section of widest general interest is that relating to the causes and treatment of crime. All students of social problems, whether from the theoretical or practical point of view, will find much that is of value in this number. If the relation between crime and feeble-mindedness, for example, were realised more consciously, then as a corollary the State treatment of the criminal would have to be modified. Progress in criminal legislation is being made slowly, but the need for a definitely scientific study of those social phenomena we vaguely subsume under the concept of crime is still insistent.

THE Bureau of American Ethnology has for some time employed Miss Frances Densmore on the task of collecting by means of the phonograph the music of the Indian tribes. About one thousand songs have already been recorded. Many of those procured from the Chippewas have to do with the belief in the Mide, or Great Medicine, the object of the ritual being to secure health and long life for its members, and to promote temperance and other virtues. Many of the songs were handed down by tradition, and the singers were assisted by a system of mnemonics recorded on a strip of birch bark. A collection of songs, known as "Dream Songs," are said to have come to the Indians in the course of dreams and trances. These are used in treating the sick. One of their medicine-men demonstrated his supernatural powers by feats of jugglery, releasing himself from bonds in a manner familiar to European performers. Indian music, except the songs of daily life, is closely connected with the supernatural, and hence it is carefully guarded by the people.

THE important piece of apparatus known as the respiration calorimeter was invented by Atwater and Benedict at Middletown, Connecticut, in 1892. Since that time the instrument has played an important part in investigations on the metabolism in man and other animals. Many improvements have been introduced, and the present form of the Atwater apparatus is now installed at Boston in a building specially devoted to metabolic research under the supervision of Prof. F. G. Benedict. Modifications are also set up in New York and various other American universities, and the latest form of improvement has just been described by Drs. Longworthy and Milner, of the Home Economics Department at Washington. This is fully described and figured in the *Journal of Agric. Research* issued by the United States Department of Agriculture (November 22, 1915). Various other changes have been introduced from time to time to suit other animals than men. In this country the unfortunate lack of funds which characterises all efforts in research has prevented the prosecution of this branch of work. So far as we are aware, there is only one respiration calorimeter in Great Britain, and this was set up by Prof. Macdonald at Sheffield University. When it is possible to divert funds from the present urgent necessities of the country, we trust that the installation of respiration calorimeters will not be neglected.

THE annual report of the Dominion Museum of New Zealand for 1915 contains some valuable notes on the Tuatera "lizard" (*Sphenodon punctatus*), which have been furnished by the lighthouse-keepers and others on Stephen Island, The Brothers, Cuvier's Island, and the Little Barrier bird sanctuary. To judge from these reports, it would seem that a great deal of unnecessary slaughter, in regard to "hawks," is going on, and under official recognition. The hawks, which are diurnal birds, are accused of preying on the Tuateras, which are nocturnal. The real culprits, it would seem, are feral cats, of which considerable numbers have been killed. If these ancient reptilia are to be preserved, a much more carefully thought-out scheme of protection must be devised. So far as the evidence furnished by this report allows one to judge, it would seem that the haunts of these animals are not sufficiently protected by scrub. If this could be appreciably increased and the cats exterminated, the Tuatera would probably need little further protection.

THE curious habit which certain minute "Chloropid" flies have of entering human habitations in vast swarms, apparently for the purpose of hibernating, has long been known. A further instance is now recorded in the *Entomologist's Monthly Magazine* for January by Mr. Hugh Scott. In this case a house about six miles from Cambridge was invaded in October last by myriads of these flies, causing great discomfort to the occupants. They occurred in two rooms only, facing the south-east, and were clustered in seething masses along the bars of the window-panes, and on the ceiling immediately above the window. Samples of the swarm proved to consist mainly of a small yellow Chloropid (*Chloropisca ornata*) and a slightly larger Anthomyid (Spilogaster), but intermingled with these were several larger species, and a few wasps. These two rooms have been invaded after this fashion for at least five or six years in succession, and in every case that on the first floor has proved the most attractive. For some quite inexplicable reason Cambridge has suffered more from this plague than any other place in England. So far back as 1831 an enormous swarm invaded the Provost's lodge at King's College, and the visitation was repeated in 1870, while of late years similar swarms have occurred in certain apartments of the museums which are near King's College, and always in the same apartments. No clue whatever as to their origin has yet been obtained.

THE current number of the Journal of the Quekett Microscopical Club (Ser. 2, vol. xii., No. 77) contains an interesting note by Mr. James Burton on the freshwater alga, *Hydrodictyon reticulatum.* This remarkable plant, which takes the form of a net, floating in the water, is not very often seen in this country. For more than thirty years Mr. Burton looked for it almost in vain, though it was known to have occurred in past times in the lake in Kew Gardens. In the autumn of 1914, however, it made its appearance in that locality in enormous quantities, so that boatmen were employed in gathering it in with rakes and piling it in heaps on the shore. In less than a month's time after first seeing it Mr. Burton was unable to find a single specimen. He compares this sudden outburst of Hydrodictyon to the so-called "breaking of the meres," caused by the sudden and rapid multiplication of other algæ. The same number also contains an obituary notice, accompanied by an excellent portrait, of the late Prof. E. A. Minchin, a former president of the club.

THE Indian jute industry formed the subject of a recent lecture by Mr. C. C. McLeod before the Royal Society of Arts, and this is now printed in the *Journal,* No. 3292, vol. lxiv., for December 24 last, with a number of illustrations showing the cultivation and mode of preparation of jute. In Bengal, Cooch Behar, and Assam more than 3,350,000 acres are under jute cultivation, and the value of raw jute exported in 1913 amounted to 20,000,000*l.* It was not until 1855 that a jute mill was started at Calcutta, and now the mills there turn out nearly 3000 tons of the manufactured article per day.

THE report of the agricultural department, Montserrat, for 1914–15 shows a satisfactory condition in the island's present position and future prospects. A definite attempt is being made to establish an onion trade in the island for the Canadian market, which promises to be successful. The bay oil industry is also receiving particular attention. Valuable work in cotton selection is being continued at the botanic station, and seed of high and uniform quality from types in the island is being selected for estate planting.

THE *Indian Forester* for November, 1915, vol. xli., No. 11, contains the first part of an interesting article on forest administration in Bashahr, the largest of the Simla Hill States. The State for its greater area lies within the drainage area of the Sutlej river, and consists of precipitous mountain country with narrow ravines. The deodar and blue pine (*Pinus excelsa*) are the prevalent trees, and the article is illustrated by photographs of some fine specimens of deodars. Girth measurements of more than 35 ft. are recorded, but the average girth in the forests is 15 ft., with height measurements of 120–150 ft. Some good pictures of the precipitous mountain-sides are also included. Mr. Glover gives a history of the forests, which have only been known since 1850. The destruction by fires and improper felling has been very great, especially about the year 1862, when scarcely a quarter of the trees felled ever reached the sale depôts, and it was estimated by Brandis that, between 1859 and 1863, 30,000 deodars had been felled from the more accessible forests. Now that the forests are under the forest service, conservation is being practised, and the natural regeneration is proceeding properly.

Symons's Meteorological Magazine for January, 1916, gives a tentative rainfall total for December, 1915, over the British Isles obtained from a representative selection of stations. The rainfall was everywhere in excess of the average except at a few stations in Scotland. The excess was greatest in the south-east and east of England, where in many places the rainfall was more than 250 per cent. of the average. At Arundel the rainfall was 289 per cent. of the average, and in London it was 255 per cent. The largest amount of rain was 21·03 in. at Borrowdale, in Cumberland, and the least was 3·43 in. at Geldeston, in Norfolk. The rainfall map for the Thames Valley shows the month to have been exceedingly wet, the rainfall values over the area ranging from about 10 to 4 inches. The general rainfall for England and Wales was 198 per cent. of the average, for Scotland 135 per cent., for Ireland 158 per cent., and for the British Isles as a whole 169 per cent. of the average. A tentative result for the whole of 1915 is also given.

THE Bulletin of the American Geographical Society for November (vol. xlvii., No. 11) contains two papers of considerable geographical value referring to people in relation to their environment. The first, by Mr. L. Dominian, deals with the peoples of northern and central Asiatic Turkey. The complexity of races in that region is analysed, and the results are shown on a coloured map. Another coloured map gives the distribution of Armenians in Turkish Armenia. The second paper is by Dr. J. Russell Smith, and discusses the adjustment of the Bedouin to his surroundings. Though it contains few new facts, it is of value for its fresh interpretation of the relations of place and people. Both papers are well illustrated.

SOME years ago Mr. G. H. Girty began to make a systematic study of the Carboniferous faunas of North America, and he has now completed a description of the fossils of the Wewoka formation in Oklahoma (Bulletin of the United States Geological Survev No. 544). This formation is especially interesting because it is far distant from the well-known Carboniferous areas further north and east, and both its sediments and its faunas show marked differences from those already studied. Most of the fossils are in a fine state of preservation, and are found weathered out of the shales. The Mollusca are especially abundant, and the Brachiopoda do not predominate so much as usual. The beautiful figures which illustrate the descriptions will be welcomed by students of Carboniferous fossils.

DR. J. W. EVANS has drawn up for H.M. Stationery Office a very useful pamphlet (price 2*d.*), entitled "Directions for the Collection of Geological Specimens." The concluding paragraph suggests that it is intended for travellers in our colonies; but it will also be found of service by those who have any leisure in our war-zones, and by students and surveyors in the British Isles. The author's experience in various continents enables him to give admirable advice on larger questions than mere collecting, such as inquiries on water supply and physiographic changes in recent times. As an example of his thoroughness, we may note his suggestion of marking strike and dip on a bedded specimen where these are of interest. The lines and figures on the specimen will then permanently record its position in the mass from which it came.

THE railway development of Africa is the subject of a useful article and map by Sir Charles Metcalfe in the *Geographical Journal* for January (vol. xlvii., No. 1). The article contains a great deal of matter in small compass. The present railways are largely feeders of rivers, or independent lines to seaports, but many projects are on foot to make the railways continuous, when the navigable reaches of the rivers will become their feeders. There will be through communication between Port Said and Cape Town by rail and steamer when the line in the Congo is finished from Kambove to Bukama, and from Stanleyville to Lake Albert, and the short section of 100 miles from Dufile to Rejaf. From Stanleyville it is probable that a line will be built to Lake Chad and continued to link up with the French Trans-Sahara railway. An alternative Cape to Cairo route will be from Broken Hill in Rhodesia, on the existing line, to the south end of Tanganyika, through what is now German East Africa to the existing Uganda railway and thence to Senaar in the Sudan. The rapidly constructed link between the Cape railways and those of the protectorate of South-west Africa are shown on the map.

THE *Educational Times* has long been the medium adopted by a certain class of mathematicians when they wish to derive what pleasure there is to be derived from puzzling over riddle-me-rees in the form of mathematical problems. From the commencement of the present year these things are transferred to a separate publication, which is to be issued monthly under the title of *Mathematical Questions and Solutions.* It is edited by Miss Constance Marks and published by Mr. Francis Hodgson, 89 Farringdon Street, London, the subscription price being 5*s.* for six months, including postage and binding cover. It contains the usual series of out-of-the-way properties of conics, triangles, and collections of algebraic symbols, and the usual neglect of aeroplanes. The latter would with very little difficulty provide enough problems to keep a journal of this kind going almost indefinitely, but aeroplanes have always been tabooed by the British mathematical world. The possibility, however, suggests itself of using the journal as a medium for getting some of the analytical details of these investigations solved by reducing them to problems in pure mathematics.

THE *Mathematical Gazette* for January contains a "bordered antilogarithm table" drawn up by Prof. G. H. Bryan and Mr. T. G. Creak. In the description the authors claim that the object of the table is to enable logarithms, logarithms of reciprocals, and antilogarithms of numbers and their reciprocals all to be taken from the same table. To do this they use a table of antilogarithms or powers of ten, with the complementary logarithms entered in the right-hand column and the bottom of the page in the same way that the ordinary trigonometric tables avoid duplication in tabulating logarithmic sines and cosines. Another feature on which the authors lay great stress is that the antilogarithms are tabulated to five significant figures in the lower parts of the scale and to four in the higher parts. This degree of approximation is both necessary and sufficient to secure the maximum degree of accuracy in working with four-figure logarithms, as the tabular differences are neither too small nor unnecessarily large.

THE *Revue générale des Sciences* for December 30, 1915, contains a well-illustrated article by M. Jacques Boyer on the manufacture of X-ray tubes in France during the war. The bulbs of the modern tubes are much larger than they were a few years ago, and the rays they produce will penetrate several centimetres of steel, and allow a radiograph of the thickest part of the body to be taken by means of a tube three metres away. At the commencement of the war the military authorities requisitioned all the X-ray tubes in France, but as this supply was found insufficient for the proper equipment of the radiological stations, the two French manufactories, which had been closed owing to their directors being called to the colours, were reopened, in one case by the recall of the director from the front, in the other by the appoinment of a member of the Academy of Sciences as director. Under the guidance of a professor of the Collège de France a firm of glass-makers began the manufacture of the special glass for the bulbs, and in a few days was turning out the necessary quantity, so that France is now producing sufficient X-ray tubes to meet her own requirements, and is supplying some to her Allies.

THE essentials in the manufacture of a good rheostat are the use of first-class material and workmanship of a high grade. This useful piece of apparatus should therefore be particularly a British product; the rheostat cannot be considered to be a "competitive" article or one lending itself particularly either to what the Germans term "Massenfabrikation" or to dumping. Yet Messrs. Isenthal and Co., in sending us a new list of their rheostats, frankly admit that they had previously imported these from abroad, but are now manufacturing them entirely in England. The list before us is one of the most complete we have seen. Both the flat slate and the tubular types have hand-shield sliders with well-designed contact-makers, and the number of different arrangements listed should meet practically every requirement. A useful variation from the ordinary flat type is one with limbs of cross-shaped section which affords increased ventilation and enables the maximum number of watts to be dissipated for the minimum dimensions without undue heating. In the tubular type the slate bars are replaced by fire-enamelled steel tubes, and the resistance wire is oxidised so that the insulation of the oxide enables the turns to be wound closely. Dimensions, approximate resistances, weights, and diagrams of connections and arrangements of the terminals are given in detail, so that it should be possible to order rheostats for almost any purpose directly from the catalogue. We trust that Messrs. Isenthal and Co. will continue to manufacture them in England after the war.

THERE is a description of one of the new British projectile-making factories given in *Engineering* for January 28, illustrated by several good photographs showing some of the shops. The nine bays of the factory cover about 196,600 sq. ft., and are arranged so as to reduce to the minimum the distance which the shell has to travel in the process of manufacture. From the entry of the rough bar to the finished shell ready to be put into the breech of a gun, the distance travelled is only 400 yards. There are nearly one hundred operations in making a shell, and many of these take but little time; hence it is important that the time spent in moving the shell from operator to operator should be as small as possible. Small shells are machined in this factory by female workers, and there are 1800 women in this department. The girls are able to work the machines in three days, and are efficient in seven days; the highest efficiency is attained after two months' experience. One skilled worker suffices for the setting of the machines for twelve female operators. The accuracy demanded is 0·004 in., and it speaks well for the girls that the rejected shells do not amount to more than one per cent.

OUR ASTRONOMICAL COLUMN.

THE SOLAR ECLIPSE OF FEBRUARY 3, 1916.—Official European observatories have perforce had to refrain from participating in the observation of to-day's total solar eclipse, notwithstanding the fact that spectroscopic interest was so unexpectedly intensified by the change recorded in the coronal spectrum at the eclipse of August 21, 1914. From the success that then attended the Spanish expedition, it might almost have been expected that the Madrid observers, at any rate, would have attempted to take advantage of the present opportunities. It would appear, however, that the American observers will have the field to themselves.

Starting in the Pacific Ocean, February 3d. 2h. 29m. G.M.T., in long. 121° 35·6′ W., lat. 7° 20·8 N., almost a minimum part of the central line of totality passes over land areas. This portion is nearly parallel to and somewhat north of the Bogota-Caracas line in Columbia and Venezuela. The line then crosses the Caribbean Sea to Guadeloupe. The duration of totality over all this section is about 2½ minutes; the maximum of 2m. 36s. is reached before quitting Venezuela. Sweeping across the Atlantic, centrality passes a little wide of the Azores, and ends about 200 miles off the south coast of Ireland (Mizen Head) at 5h. 31·0m., in long. 9° 50·2′ W. and lat. 49° 23·8′ N. A partial eclipse will consequently be visible over the greater part of the Americas.

In south-west Europe, north-west Africa, and the British Islands the eclipse will only be partly visible, the sun setting in partial eclipse. At Greenwich the eclipse begins at 4h. 31m., and the sun sets at 4h. 49m., with about one-quarter of the disc obscured. The magnitude of the eclipse increases as the observer is situated further west, until in the south-west of Ireland the obscuration reaches about nine-tenths of the disc.

COMET 1915*e* (TAYLOR).—Prof. E. Strömgren has sent to NATURE his latest observation of the position of this comet, made on January 23. At 5h. 47m. 6s. G.M.T. the comet's position was α app., 5h. 10m. 1·89s., δ app. +16° 56′ 54·1″, whence the corrections of the ephemeris of Copenhagen Circular No. 11, $\Delta\alpha = 0$s., $\Delta\delta = +0{\cdot}8'$ The comet is stated to have been of the eleventh magnitude.

COLOURS OF STARS IN THE CLUSTERS N.G.C. 1647 AND M. 67.—The first statistical investigation employing the colour classes recently proposed by Prof. F. H. Seares deals with the distribution of colours among the stars in the above clusters (Proc. Nat. Acad. of Sci., i., p. 483). Hertzsprung and Seares have respectively published effective wave-lengths and colour indices for a number of the stars in N.G.C. 1647 (NATURE, September 23, 1915). Hertzsprung's results were alone taken into account, leading to the following correspondences between effective wave-length and colour class:—

Effective w.l.	4190	4260	4330	4400	4470	4540
Colour class	b0	a0	f0	g0	k0	m0

N.G.C. 1647 is principally made up of *a* and *f* stars, but contains a number of *b* and also some *km*, whilst